INEEL/EXT-02-01399
Revision 3
Project No. 23094

Health and Safety Plan for the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of TSF-06/26 Sites at Waste Area Group 1, Operable Unit 1-10

Todd F. Lewis, CIH

September 2003

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

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Idaho National Engineering and Environmental Laboratory
Idaho Completion Project
Idaho Falls, Idaho 83415

Prepared for the
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Assistant Secretary for Environmental Management
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ABSTRACT

This Health and Safety Plan establishes the procedures and requirements that will be used to eliminate or minimize health and safety risks to personnel working at the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of TSF-06/26 Sites at Waste Area Group 1, Operable Unit 1-10, as required by the Occupational Safety and Health Administration standard, "Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)." This Health and Safety Plan contains information about the hazards involved in performing the work as well as the specific actions and equipment that will be used to protect personnel while working at the task site.

This Health and Safety Plan is intended to give safety and health professionals the flexibility to establish and modify site safety and health procedures throughout the entire span of site operations based on the existing and anticipated hazards.

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ACRONYMS

ACGM	American Conference of Governmental Industrial Hygienists
bgs	below ground surface
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CFA	Central Facilities Area
CLP	Contract Laboratory Program
CRC	contamination reduction corridor
CRZ	contamination reduction zone
CY	calendar year
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EPA	U.S. Environmental Protection Agency
ERO	Emergency Response Organization
ES&H	environment, safety, and health
FRG	final remediation goal
FTL	field team leader
HASP	Health and Safety Plan
HAZWOPER	hazardous waste operations and emergency response
HSO	health and safety officer
IDEQ	Idaho Department of Environmental Quality
IH	industrial hygienist
INEEL	Idaho National Engineering and Environmental Laboratory
JSA	job safety analysis
MCP	management control procedure
OMP	Occupational Medical Program
OSHA	Occupational Safety and Health Administration

PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PLN	plan
PPE	personal protective equipment
PRD	program requirements document
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RD/RA	remedial design/remedial action
ROD	Record of Decision
RWMC	Radioactive Waste Management Complex
RWP	radiological work permit
SVOC	semivolatile organic compound
SWP	safe work permit
TAN	Test Area North
TLV	threshold limit value
TPR	technical procedure
TSF	Technical Support Facility
TWA	time-weighted average
UV	ultraviolet light
VPP	Voluntary Protection Program
WAG	waste area group
WCC	Warning Communications Center

Health and Safety Plan for the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of TSF-06/26 Sites at Waste Area Group 1, Operable Unit 1-10

1. INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) establishes the procedures and requirements that will be used to eliminate or minimize health and safety hazards to personnel working at the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of Technical Support Facility (TSF) -06/26 Sites at Waste Area Group (WAG) 1, Operable Unit (OU) 1-10 at the Idaho National Engineering and Environmental Laboratory (INEEL). Figure 1-1 shows the location of the INEEL.

1.2 Scope and Objectives

This HASP has been written to meet the requirements of the Occupational Safety and Health Administration (OSHA) standard, 29 *Code of Federal Regulations* (CFR) 1910.120, "Hazardous Waste Operations and Emergency Response." This HASP governs all work at the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of TSF-06/26 Sites at WAG 1, OU 1-10 that is performed by INEEL management and operations contractor personnel, subcontractors, and any other personnel who enter the project area.

This HASP has been reviewed and revised, as deemed appropriate by the health and safety officer (HSO) in conjunction with other project personnel and management to ensure its effectiveness and suitability.

1.3 Idaho National Engineering and Environmental Laboratory Site Description

The INEEL, formerly the National Reactor Testing Station, encompasses 2,305 km^2 (890 mi’) and is located approximately 55 km (34 mi) west of Idaho Falls, Idaho. The U.S. Department of Energy Idaho Operations Office (DOE-ID) is responsible for the INEEL and designates authority to operate the INEEL to government management and operating contractors.

The United States Atomic Energy Commission, now the U.S. Department of Energy (DOE), established the National Reactor Testing Station (now the INEEL) in 1949 as a site for building and testing a variety of nuclear facilities. The INEEL also has been the storage facility for transuranic radionuclides and radioactive low-level waste since 1952. At present, the INEEL supports the engineering and operations efforts of DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, energy technology and conservation programs, and DOE long-term stewardship programs.

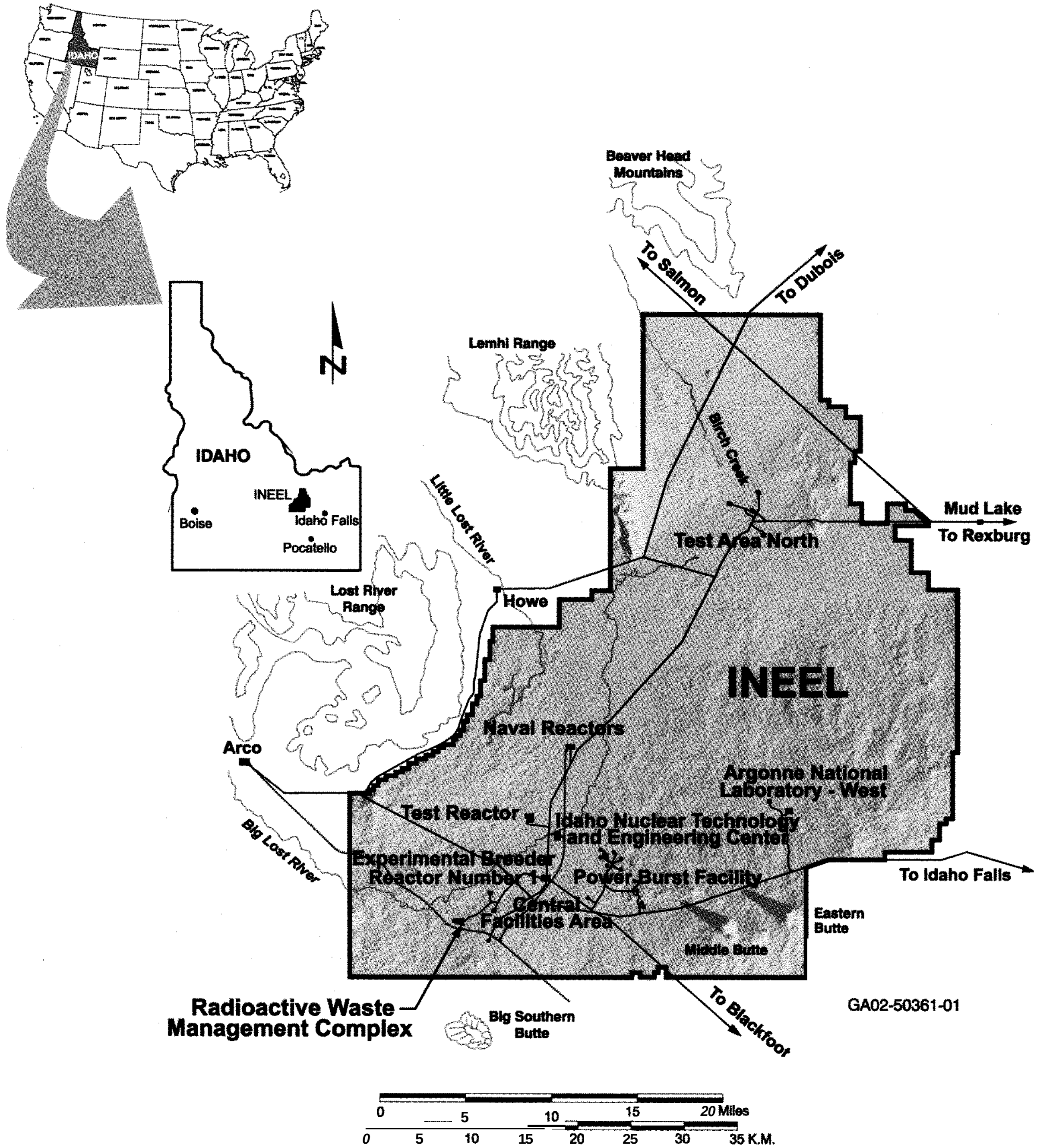

Figure 1-1. Location of the Idaho National Engineering and Environmental Laboratory.

1.4 Background and Project Site Description

This section provides an overview of the history, location, and previous field activities conducted at this work site. Previous investigation data results are presented to characterize site conditions.

The INEEL is a government-owned facility managed by the DOE; it is located in southeastern Idaho, 55 km (34 mi) west of Idaho Falls (as shown in Figure 1-1). The INEEL encompasses approximately 2,305 km^2 (890 mi') of the northwestern portion of the eastern Snake River Plain and extends into portions of five Idaho counties.

In November 1989, the U.S. Environmental Protection Agency (EPA) placed the INEEL on the "National Priorities List of Uncontrolled Hazardous Waste Sites; Final Rule" (54 FR 48184) because of confirmed contaminant releases to the environment. In response to this listing, the DOE, EPA, and Idaho Department of Environmental Quality (IDEQ)—hereinafter referred to as the Agencies—negotiated the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991a) and *Action Plan for Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991b). The Agencies signed these documents in 1991, thereby establishing the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.), Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.), and the Idaho Hazardous Waste Management Act (Idaho Code § 39-4401 et seq.).

To better manage cleanup activities, the INEEL was divided into 10 WAGs. Test Area North (TAN), designated as WAG 1, includes fenced areas and immediate areas outside the fence lines at the TSF, the Initial Engine Test Facility, the Loss-of-Fluid Test (LOFT) Facility, the Specific Manufacturing Capability Facility, and the Water Reactor Research Test Facility (DOE-ID 1999).

As shown in Figures 1-1 and 1-2, TAN is located in the north-central portion of the INEEL. The facility was constructed between 1954 and 1961 to support the Aircraft Nuclear Propulsion Program, which developed and tested designs for nuclear-powered aircraft engines. When Congress terminated this research in 1961, the area's facilities were converted to support a variety of other DOE research projects. From 1962 through the 1970s, the area was devoted principally to the LOFT Facility, where reactor safety testing and behavior studies were conducted. Beginning in 1980, the area was used to conduct research and development with material from the 1979 Three-Mile Island reactor accident (DOE-ID 1998). During the mid-1980s, the TAN Hot Shop supported the final tests for the LOFT Program. Current activities include the manufacture of armor for military vehicles at the Specific Manufacturing Capability Facility and nuclear storage operations at TSF. Decontamination and decommissioning have been completed recently at the Initial Engine Test Facility.

The Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory (DOE-ID 1991a) also established 10 OUs within WAG 1, consisting of 94 potential release sites (DOE-ID 1999). The sites include various types of pits, spills, ponds, aboveground and underground storage tanks, and a railroad turntable. A comprehensive remedial investigation/feasibility study was initiated in 1995 to determine the nature and extent of contamination at TAN under OU 1-10, defined in the Federal Facility Agreement and Consent Order (DOE-ID 1991a) as the *Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 1997). The Comprehensive Remedial Investigation/Feasibility Study culminated with the finalization of the *Record of Decision—Declaration for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites Final Remedial Action* (DOE-ID 1995), which provides

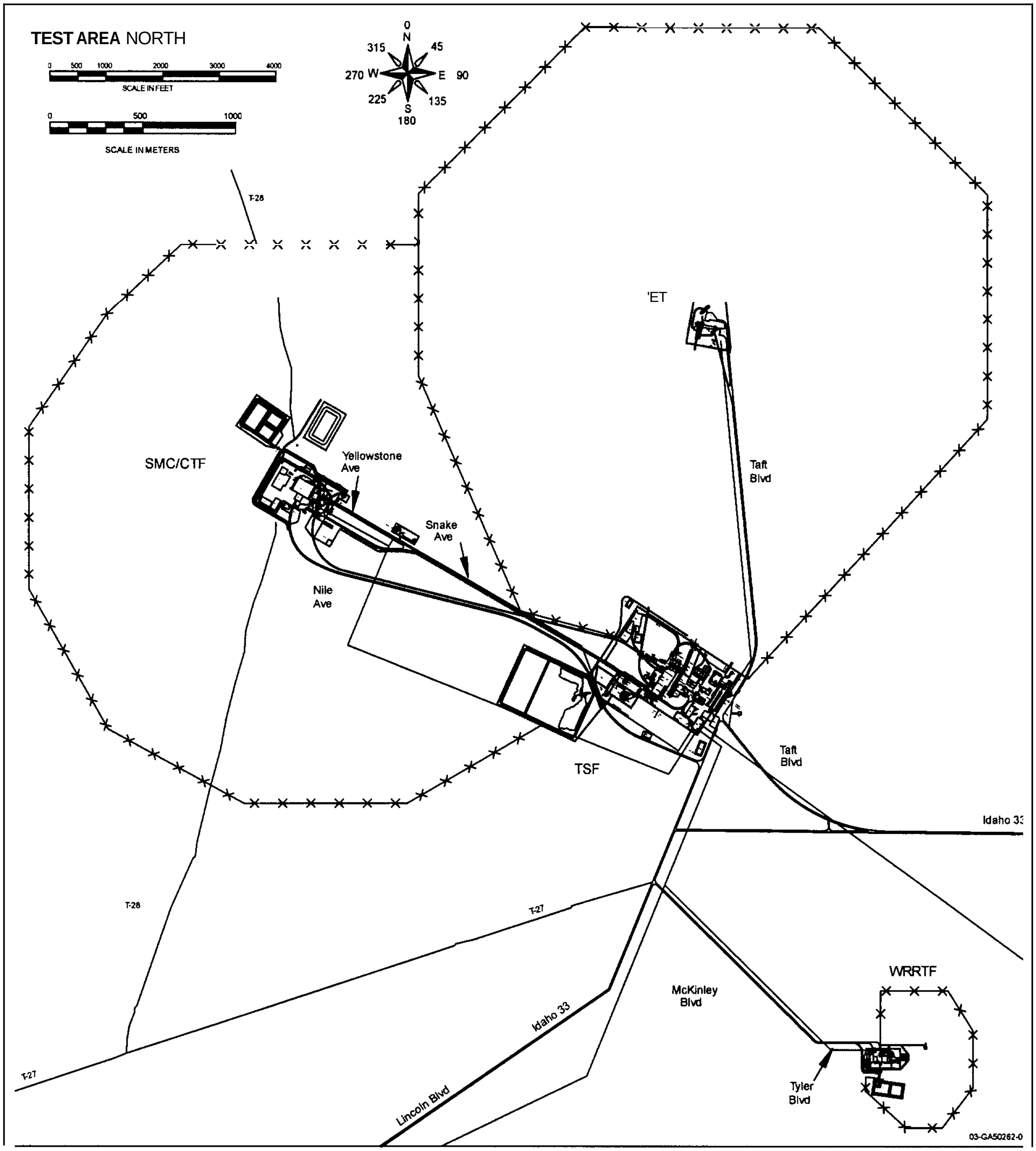

Figure 1-2. Map of the Test Area North Complex at the Idaho National Engineering and Environmental Laboratory.

information to support remedial actions for eight sites where contaminants present an unacceptable **risk** to human health and the environment. This HASP addresses field activities at the TSF-06 and TSF-26 remedial design/remedial action (RD/RA) sites:

- Soil contamination area south of the turntable (TSF-06, Area B)
- PM-2A tank site (TSF-26).

The remaining sites are either covered by another decision document; were documented as "No Action" or "No Further Action" sites in the *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999); or will be further evaluated by another WAG at the INEEL.

1.4.1 Soil Contamination Area South of the Turntable (TSF-06, Area B)

The TSF-06, Area B site is an open soil area bounded by the TSF fence on the west and facility roads and several adjacent structures on the east and south, as shown in Figure 1-3. This area is roughly triangular and measures approximately 205.8 m (675 ft) wide on the south by 129.6 m (425 ft) wide on the west.

Surface soil at TSF-06, Area B was radioactively contaminated by windblown deposition of radioactive particles from contaminated soil at the PM-2A tank site (TSF-26), which is located just south of TSF-06, Area B. Site history, process knowledge, and sampling and analysis indicate that the primary contaminants known or suspected to be in the soil at the PM-2A tanks include metals (barium, cadmium, chromium, lead, mercury, and silver), volatile organic compounds (VOCs) (trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, and acetone), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and radionuclides (Cs-137, Co-60, Eu-154, and Sr-90) (DOE-ID 1997).

During Calendar Year (CY) 2000, sampling and remediation were performed at the TSF-06, Area B as part of post-Record of Decision sampling. Activities included radiological field screening and sampling to support soil excavation of the TSF-06, Area B contaminated overburden soil, subsequent removal and containerization of the contaminated overburden, and further field screening and sample analyses to support future remediation. Following completion of the sampling and remediation activities, and receipt of a no-longer-contained-in determination from the IDEQ, the containerized soil was transported to the Radioactive Waste Management Complex (RWMC) for disposal.

Residential screening results in the Comprehensive Remedial Investigation/Feasibility Study (DOE-ID 1997) indicate that the contaminant of concern for TSF-06, Area B is Cs-137. In addition, while thought unlikely, the possibility exists that other nonradionuclide contaminants associated with the PM-2A tanks might have migrated to the TSF-06, Area B site. Based on process knowledge, waste will be managed as RCRA-listed waste (F001).

1.4.2 PM-2A Tanks (TSF-26 and TSF-06)

The PM-2A tank site (TSF-26) consists of the contaminated soil area surrounding two abandoned underground storage tanks, designated as Tanks V-13 and V-14, but also known as TSF-709/710 or TSF-710 A&B. The tanks are each 50,000-gal capacity tanks and are approximately 55 ft long and 12.5 ft in diameter. Installed in the mid-1950s, the tanks stored concentrated low-level radioactive waste from the TAN-616 evaporator from 1955 to 1972 (DOE-ID 1997). In 1972, a new evaporator system (called the PM-2A System) was installed in the TSF-26 area to replace the existing TAN-616 Evaporator System, which was failing. The PM-2A tanks served as feed tanks for the new evaporator system, in which liquid waste was evaporated, condensed, passed through an ion-exchange column, and discharged as clean water into the TSF-07 disposal pond. The system was shut down in 1975 because of operational difficulties and spillage (DOE-ID 1997).

The 1982 decontamination and decommissioning effort and the Track 2 investigation indicate that contaminants in the soil are suspected to include metals (barium, cadmium, chromium, lead, mercury, and silver), VOCs (trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, and acetone), SVOCs, PCBs, and radionuclides (Cs-137, Co-60, Eu-154, and Sr-90).

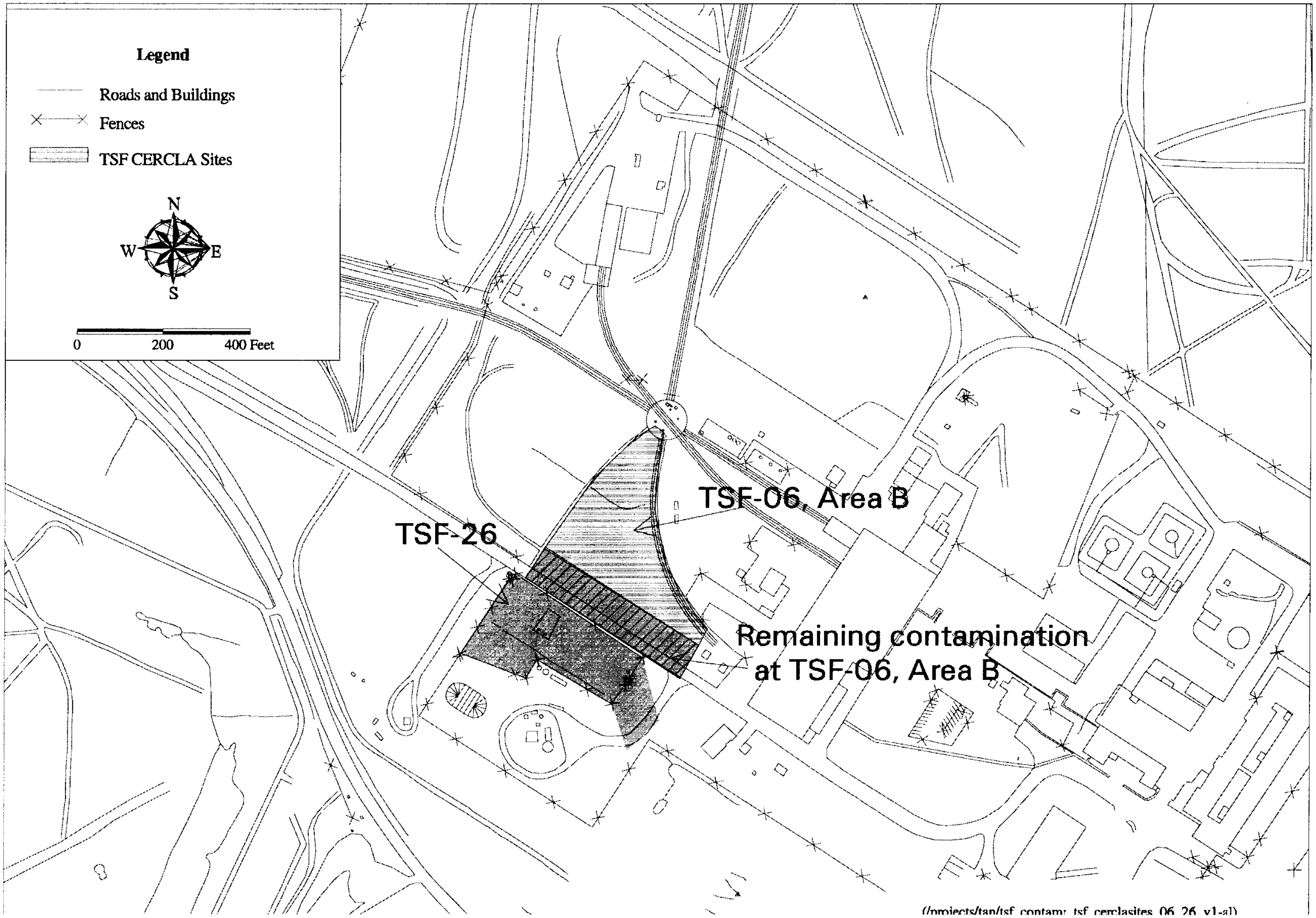

Figure 1-3. Soil contamination area south of the turntable (TSF-06, Area B) and PM-2A tank site (TSF-26).

In 1995, a non-time-critical removal action was performed at TSF-26, during which contaminated soil above a 15-pCi/g field screening action level was removed from TSF-26. Three soil stockpiles with gamma radiation readings greater than allowed by the project's work-control documentation were left at the TSF-26 site. Sampling, which occurred after the removal action, indicated that an area of 30 m (100 ft) by 21.3 m (70 ft) by 5.2 m (17 ft) below ground surface (bgs) was contaminated with Cs-137 at levels that posed an unacceptable risk to human health and the environment (DOE-ID 1999).

1.5 Previous Investigations

The following sections describe in more detail the previous investigations that have been conducted at the TSF-06, Area B and TSF-26 sites.

1.5.1 Soil Contamination Area South of the Turntable (TSF-06, Area B)

The northern windrow showed Cs-137 concentrations consistently above 23.3 pCi/g at both 0 and 6 in. bgs. This indicated evidence of homogeneous contamination throughout the length and depth of the pile. The center windrow showed a small section of soil below 23.3 pCi/g, while the remainder of the soil measured above 23.3 pCi/g for Cs-137. The third windrow was grab-sampled only; one sample exhibited levels above the 23.3-pCi/g level.

Core samples were collected with a hand auger from the native soil's surface to 18 in. bgs at 6-in. intervals along four parallel rows. Then, the samples were analyzed for Cs-137 concentrations by conventional gamma spectrometry at the Idaho Nuclear Technology and Engineering Center laboratory. Data results indicated that contamination concentrations were the highest in the two southern rows closest to the Snake Avenue roadside. As shown in Table 1-1, 10 of the 64 samples collected from the surface level exceeded the 23.3-pCi/g final remediation goal (FRG) for Cs-137 (25.4, 26.6, 36.1, 42.9, 64.7, 105, 107, 191, 537, and 538 pCi/g), and five samples collected from the 6-in.-bgs interval exceeded the 23.3-pCi/g FRG for Cs-137 (35.6, 62.7, 63.1, 180, and 1,139 pCi/g). No Cs-137 was detected above the 23.3-pCi/g FRG at either the 12- or 18-in. intervals.

1.5.2 PM-2A Tanks (TSF-26 and TSF-06)

In 1998, the soil surrounding the PM-2A tanks was evaluated during a DOE environmental survey. Four borings were drilled near the PM-2A tanks; radiological analyses were performed, which showed levels of Cs-137 contamination (1.7 to 120 pCi/g) in the soil to at least 5.2 m (17 ft) bgs (DOE-ID 1997).

In 1993, the Track 2 investigation was conducted of the PM-2A tanks. Information regarding the Track 2 investigation can be found in the *Preliminary Scoping Track 2 Summary Report **for** the Test Area North Operable Unit 1-05: Radioactive Contamination Sites* (INEEL 1994), but is also summarized in the Comprehensive Remedial Investigation/Feasibility Study (DOE-ID 1997). During the investigation, one deep and three shallow borings were completed and sampled; grab samples from the surface also were collected. Radiological analyses performed on the surface samples indicated elevated gross beta and gamma activities. Organic analyses for SVOCs, VOCs, and PCBs were conducted on the samples from the three shallow borings. No VOCs, SVOCs, or PCBs were detected in any of the soil samples from the Track 2 investigation (DOE-ID 1997). A composite sample—composed of cuttings from the surface to 9 m (30 ft) bgs—was collected and analyzed for gross beta activity, gross alpha activity, gamma activities, six Contract Laboratory Program (CLP) metals, CLP VOCs, CLP SVOCs, and PCBs. The results of the analyses indicated elevated gross beta and gamma activities in composite deep-bore drill cuttings; no VOCs, SVOCs, or PCBs were detected in any of the soil samples.

Table 1-1. Results of final Calendar Year 2000 sampling of TSF-06, Area B.

Location	Sample Location Number	Cs-137 Results (pCi/g) 0 in. bgs	Cs-137 Results (pCi/g) 6 in. bgs
Row 1	29	25.4	—[a]
Row 3	62	26.6	—
Row 3	55	36.1	—
Row 3	50	—	180
Row 3	47	64.7	—
Row 3	39	42.9	—
Row 3	31	107	1,139
Row 3	26	191	—
Row 3	18	105	62.7
Row 3	15	537	—
Row 3	10	538	63.1
Row 4	7	—	35.6

a. "—" indicates that the sample result did not exceed the 23.3-pCi/g final remediation goal.

Contaminated soil was removed from TSF-26 in 1995 as part of the OU 10-06 removal action. Soil with gamma radiation readings greater than 15 pCi/g (field screening action level) was removed from locations identified as pre-excavation "hot spots." Three soil stockpiles exhibiting gamma radiation readings greater than allowed by the work control documentation remained at the site following the OU 10-06 excavation. In addition, what appeared to be a wooden box was discovered near the PM-2A tanks. No process knowledge or reports from operation of the PM-2A evaporator provided any information about the wooden box; it was not opened or investigated at the time of the removal action. Sampling, which was performed after the removal action, indicated an area—approximately 30.5 m (100 ft) by 21.3 m (70 ft) to 5.2 m (17 ft) bgs-contaminated with Cs-137 at levels that potentially posed an unacceptable risk to human health and the environment (DOE-ID 1999).

In 1998, six sampling locations were selected to characterize the soil at the PM-2A tank site. Samples were collected at each location using a split spoon sampler from three depth intervals: 0 to 0.8 m (0 to 2.5 ft), 1.5 to 2.3 m (5 to 7.5 ft), and 2.3 to 3 m (7.5 to 10 ft). These samples were analyzed for CLP VOCs, toxicity characteristic leaching procedure (TCLP) VOCs, PCBs, and TCLP metals. No VOCs, PCBs, or metals were detected above background concentrations in the 1998 PM-2A tank soil samples."

In March 2000, the three soil stockpiles and the wooden box were sampled to obtain additional data to support remediation, obtain a no-longer-contained-in determination for the soil, and provide necessary concentration data to proceed with the TSF-06/26 remedial action. The samples of the soil stockpiles and wooden box were collected in accordance with the *Field Sampling Plan for Post-Record of Decision Sampling and Field Screening of Selected Sites at Waste Area Group 1, Operable Unit 1-10*

a. Hain, K. E., U.S. Department of Energy Idaho Operations Office, to W. Pierre, U.S. Environmental Protection Agency, Region 10, and D. Nygard, Idaho Department of Health and Welfare, November 3, 1998, "Transmittal of Analytical Results and Limitations and Validation Reports for WAG-1 Surface Soil Sampling at the V-Tank and PM-2A Tank Sites," OPE-ER-169-98.

(DOE-ID 2000). Samples were analyzed for VOCs, SVOCs, PCBs, total metals, TCLP metals, and radionuclides. Gross alpha and beta results also were obtained to provide information for the planned, future disposal of this soil. Data results revealed non-detects for SVOCs and PCBs; some VOCs were detected at insignificant levels. Radionuclide results showed Cs-137 concentrations up to 3,600 pCi/g in the soil stockpiles, which was similar to the 4,400-pCi/g maximum sample result obtained during the OU 10-06 removal action, as documented in the Comprehensive Remedial Investigation/Feasibility Study (DOE-ID 1997). Radionuclide sample results for the wooden box were significantly higher than the results for the soil stockpiles. The maximum Cs-137 concentration was 710,000 pCi/g from one sample location, suggesting that the wooden box served as some type soil containment with elevated concentration levels.

In addition to the TSF-26 soil stockpiles and wooden box sampling activities conducted during CY 2000, various other radionuclide field-screening/sampling events were performed to obtain information on the CY 2000 remediation efforts and to support future site remediation (INEEL 2002). In August 2000, the latest radiological sampling event for TSF-26 was performed to obtain data results regarding the vertical nature and extent of contamination. Grab samples were collected at 6-, 12-, and 18-in. intervals throughout the TSF-26 site at 18 sample points spaced approximately 50 ft apart.

As shown in Table 1-2, of the 18 sample points, five samples exceeded the 23.3-pCi/g FRG for Cs-137 at surface level (0 in.) (40.3, 41.7, 66.7, 104, and 184 pCi/g), and one sample exceeded the 23.3-pCi/g FRG for Cs-137 in the 0–6-in. interval (32.2 pCi/g). No Cs-137 was detected above the 23.3-pCi/g FRG at either 12- or 18-in. intervals.

Table 1-2. Results of Calendar Year 2000 sampling of the PM-2A tank site (TSF-26).

Sample Identification Number	Cs-137 Results (pCi/g)	
	0 in. bgs	6 in. bgs
8	41.7	—[a]
6	40.3	—
34	184	32.2
39	104	—
41	66.7	—

a. "—" indicates that the sample result did not exceed the 23.3-pCi/g final remediation goal.
bgs = below ground surface

1.6 Scope of Work

Soil sampling data for the TSF-06 and TSF-26 sites will be supplemented to provide comprehensive information to ensure that remediation alternative decisions, including possible waste disposal requirements for the INEEL CERCLA Disposal Facility landfill, can be made. In addition, data to support the RCRA closure of the PM-2A tanks and feed lines to the PM-2A tanks through TSF-06, Area **B** and TSF-26 will be collected. At the completion of TSF-06 and TSF-26 remediation action, confirmation sampling will be conducted to ensure that the 23.3-pCi/g FRG for Cs-137 is met.

1.6.1 Pre-excavation and Confirmation Soil Sampling

The scope for soil sampling is covered in the *Field Sampling Plan for Post-Record of Decision Sampling and Field Screening of Selected Sites at Waste Area Group I, Operable Unit 1-10*

(DOE-ID 2000). Soil samples will be obtained using a hydraulic probe and/or rotary drill rig with a split spoon sampler. Hazards associated with the use of these methods are covered in Section 2.2.12.1, "Drilling Operation," of this HASP. All operators should read and understand this section.

A manual hand auger also may be employed to obtain soil samples. Hand augering is potentially hazardous with most common injuries being cuts, bruises, and cumulative trauma disorders. All operators should read and follow Management Control Procedure (MCP) -2692, "Ergonomics Program."

In the unlikely event that a utility or other underground obstacle is struck while drilling, TAN Operations must be immediately contacted and drilling safely stopped. A recovery plan can then be developed.

1.6.2 Soil Excavation, Backfill, Packaging, and Shipment

Soil excavation will be conducted until the FRGs are met. The soil will be packaged and shipped in accordance with current guidelines and regulations. Backfill will be accomplished with clean soil in accordance with work control documentation. Heavy equipment will be employed during these processes. Hazards associated with these operations are discussed in Section 2.2.10, "Heavy Equipment and Moving Machinery." Soil will be loaded into burrito bags inside roll-offs or dump trucks. The bags will be sealed and the containers hauled to the INEEL CERCLA Disposal Facility for storage and/or disposal.

1.6.3 Construct Temporary Road if Required

If required, a temporary road will be constructed in accordance with the applicable Engineering Design File or other work control documentation. An unexploded ordnance survey and a Road Outage Permit might be required before constructing a temporary road. Heavy equipment will be employed during temporary road construction. Awareness of the movement of this equipment and equipment ancillary to this job is required to work safely.

2. HAZARD IDENTIFICATION AND MITIGATION

The overall objective of this section is to identify existing and anticipated hazards based on the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of the TSF-06/26 Sites at WAG 1, OU 1-10 scope of work and to provide controls to eliminate or mitigate these hazards. These include the following:

- Evaluating each project task to determine the safety hazards, and radiological, chemical, and biological exposure potential to project personnel by all routes of entry

- Establishing the necessary monitoring and sampling required to evaluate exposure and contamination levels, determine action levels to prevent exposures, and provide specific actions to be followed if action levels are reached

- Determining the necessary engineering controls, isolation methods, administrative controls, work practices, and (where these measures will not adequately control hazards) personal protective equipment (PPE) to further protect project personnel from hazards.

The purpose of this hazard identification section is to lead the user to an understanding of the occupational safety and health hazards associated with project tasks. This will enable project management and safety and health professionals to make effective and efficient decisions related to the equipment, processes, procedures, and the allocation of resources to protect the safety and health of project personnel.

The magnitude of danger presented by these hazards to personnel entering work zones depends on both the nature of tasks being performed and the proximity of personnel to the hazards. Engineering controls will be implemented (whenever possible) along with administrative controls, work practices, and PPE to further mitigate potential exposures and hazards. This section describes the chemical, radiological, safety, and environmental hazards that personnel may encounter while conducting project tasks. Hazard mitigation provided in this section in combination with other work controls (e.g., technical procedures [TPRs], work orders, job safety analysis [JSA], and Guide [GDE]-6212, “Hazard Mitigation Guide for Integrated Work Control Process”) also will be used where applicable to eliminate or mitigate project hazards.

Note: Examples of subcontractor flow-down requirements are those listed on the completed INEEL Form 540.10, “Subcontractor Requirements Manual (SRM) Applicability;” *Subcontractor Requirements Manual;* and contract general and special conditions. In addition, subcontractors are expected to take a proactive role in hazard identification and mitigation while conducting project tasks and must report unmitigated hazards to the appropriate project point of contact. Subcontractors are responsible for meeting all applicable INEEL MCP, program requirements document (PRD), Voluntary Protection Program (VPP), and Integrated Safety Management System (ISMS) mitigative actions within the documented work controls.

2.1 Chemical and Radiological Hazards and Mitigation

Personnel could be exposed to chemical and radiological hazards while working at the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of TSF-06/26 Sites at WAG 1, OU 1-10.

Several additional field screening and sampling/analysis events were performed during CY 2000 to further understand the nature and extent of the windblown contamination originating from the TSF-26 PM-2A tank site and to obtain analytical data to support remediation (INEEL 2002). Following an

April 2000 sampling event, remediation of the TSF-06, Area B site was performed in July 2000 to remove the top 6 in. of overburden from the site. The contaminated soil was bladed with a road grader and then loaded into soft-sided soil bags with a front-end loader. The soil bags were temporarily stored in a CERCLA storage area before disposal. Table 2-1 lists the worker health-based chemical contaminants of concern that could be encountered while conducting project tasks.

2.1.1 Routes of Exposure

Chemical and radiological hazards will be eliminated, isolated, or mitigated to the extent possible during all project tasks. Where they cannot be eliminated or isolated, monitoring for chemical and radiological hazards will be conducted (as described in Section 3) to detect and quantify exposures. Administrative controls, training, work procedures, and protective equipment will be used to further reduce the likelihood of exposure to these hazards. Table 2-2 summarizes each primary project task, associated hazards, and mitigation procedures.

The JSAs, Industrial Hygiene exposure assessments, and radiological work permits (RWPs) may be used in conjunction with this HASP to address specific hazardous operations (e.g., hot work) and radiological conditions at the project site. If used, these permits will further detail specialized PPE and dosimetry requirements.

2.1.2 Specific Project Controls

The primary control on the site during excavation, backfill, and packaging will be wetting and misting methods (if required) to keep dust and contaminants from becoming airborne. In addition, PPE will be worn as required by task-specific JSAs and this HASP.

No detectable personnel exposures to 1,1,1-trichloroethane are expected during sampling activities. Random real-time monitoring will be performed to support this assumption. Surface misting of cuttings being pulled up by the auger will serve as the primary control. In addition, PPE will be worn as required by the task-specific JSA and this HASP.

2.2 Safety and Physical Hazards and Mitigation

Industrial safety and physical hazards will be encountered while performing field sampling, field screening, soil excavation, backfill, packaging, and shipment of the TSF-06/26 sites at WAG 1, OU 1-10. Section 4.2 provides general safe-work practices that must be followed at all times. The following sections describe specific industrial safety hazards and procedures that must be followed to eliminate or minimize potential hazards to project personnel.

As mentioned in Section 1.5, previous investigations conducted at the TSF-06, Area B and TSF-26 sites reflect some levels of Cs-137 greater than the 23.3-pCi/g FRG. Some VOCs were detected, and minute amounts of SVOCs and PCBs were suspected to be potentially present.

Table 2-1. Evaluation of health-based contaminants of concern at the Test Area North site.

Material or Chemical (CAS No., Vapor Density, and Ionization Energy)	Exposure Limit[a] (PEL and TLV)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)'	Matrix or Source at Project Site
1,1,1-Trichloroethane (71-55-6)	TLV = 350 ppm PEL = 350 ppm	Inhalation, ingestion, and contact hazard	Irritation of eyes, skin, nose, throat, and respiratory tract; CNS damage	Eyes, CNS, kidney, and liver	No (NTP) No (IARC) No (OSHA) A4 (ACGIH)	In soil as historical spillage, low exposure potential
Aroclor-1260 (11096-82-5)	Not available (nearly identical product — Aroclor-1254) (chlorodiphenyl 54% Cl): TLV = 0.5 mg/m^3 PEL = 0.5 mg/m^3	Inhalation, ingestion, contact hazard, skin	Eye irritation, chloroacne, liver damage, reproductive effects	Slun, eyes, liver, reproductive organs	Not available Aroclor-1254' (chlorodiphenyl 54% Cl) ACGIH—A3[c] IARC—2A[c] NTP—R'	Low potential Maximum concentration detected = 310 mg/kg (sludge)
Carbon monoxide (6308-0) Vapor density—0.789	PEL = 50 ppm TLV = 25 ppm	Inhalation	Headache, confusion, nausea, dizziness; excessive exposure could be fatal.	Blood oxygen carrying capacity	No	Low-moderate potential associated with equipment operation and cutting operations
Chromium (7440-47-3)	TLV = 0.5 mg/m^3 (Cr III) TLV = 0.01 mg/m^3 (Cr VI) PEL = 1 mg/m^3 (Cr metal) PEL = 0.5 mg/m^3 (Cr III)	Inhalation, ingestion, contact hazard, skin	Eye and skin irritation, lung fibrosis	Eyes, skin, respiratory system	Chromium V1[c] ACGIH—A1[c] IARC—1[c] NTP—K[c]	Low-moderate potential Maximum concentration detected = 1,100 mg/kg (sludge)

Table 2-1. (continued).

Material or Chemical (CAS No., Vapor Density, and Ionization Energy)	Exposure Limit[a] (PEL and TLV)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)"	Matrix or Source at Project Site
Lead (7439-92-1)	TLV = 0.05 mg/m³ PEL = 0.05 mg/m³	Inhalation, ingestion, contact hazard	Weakness, weight loss, anemia, nausea, vomiting, paralysis, constipation, insomnia, abdominal pain, ludney disease, eye irritation	GI tract, CNS, kidneys, blood, gingival tissue, eyes	ACGIH—A3[c] IARC—2B[c]	Low potential Maximum concentration detected = 592 mg/kg (sludge)
Mercury (7439-97-6)	TLV = 0.025 mg/m³ PEL = 0.1 mg/m³ ceiling	Inhalation, ingestion, contact hazard, skin	Eye and slun irritation, chest pain, breathing difficulty, tremor, insomnia, headache, fatigue, gastrointestinal disturbance, weight loss	Eyes, skin, respiratory system, CNS, kidneys	ACGIH—A4[c] IARC—3[c]	Low-moderate potential Maximum concentration detected = 2,110 mg/kg (sludge)
Silica (14808-60-7)	TLV = 0-05 mg/m³	Inhalation	Cough, difficulty breathing, decreased pulmonary function, irritated eyes	Eyes, respiratory system	ACGIH—A2 IARC—1 NTP—K[c]	—
Tetrachloroethene (127-18-4)	TLV = 25 pprn TLV = 100 ppm ceiling PEL = 100 ppm	Inhalation, ingestion, contact hazard, slun	Eye, skin, nose, throat, respiratory irritant; nausea; dizziness; headache; drowsiness; red skin; liver damage	Eyes, skin, respiratory system, liver, kidneys, CNS	ACGIH—A3[c] IARC—2B[c] NTP—R[c]	Low potential Maximum concentration detected = 600 mg/kg (sludge)

Table 2-1. (continued).

Material or Chemical (CAS No., Vapor Density, and Ionization Energy)	Exposure Limit[a] (PEL and TLV)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)'	Matrix or Source at Project Site
Trichloroethene (79-01-6)	TLV = 50 ppm TLV = 100 pprn ceiling PEL = 100 ppm PEL = 200 ppm ceiling	Inhalation, ingestion, contact hazard, skin	Eye and skin irritation, vertigo, fatigue, tremor, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, liver injury	Eyes, skin, respiratory system, heart, liver, kidneys, CNS	ACGIH—A5[c] IARC—3[c] NTP—R[c]	Moderate potential Maximum concentration detected = 22,000 mg/kg (sludge) 410 mg/L (liquid)
Radionuclides—Cs-137 (dominant radioisotopes)						
Radionuclides (whole-body exposure)	In accordance with PRD-183, "INEEL Radiological Control Manual"	Whole body	Acute gastrointestinal disorders, bacterial infections, hemorrhaging, anemia, loss of body fluids, cataracts, temporary sterility Chronic cancer, pre-cancerous lesions, benign tumors, cataracts, skin changes, congenital defects	Blood forming cells, gastrointestinal tract, and rapidly dividing cells	Yes	Low levels detected in soil samples Low exposure potential

Table 2-1. (continued).

Material or Chemical (CAS No., Vapor Density, and Ionization Energy)	Exposure Limit” (PEL and TLV)	Routes of Exposure	Symptoms of Overexposure[b] (Acute and Chronic)	Target Organs and System	Carcinogen? (Source)“	Matrix or Source at Project Site

a. Sources: ***Threshold Limit Values Booklet*** (ACGIH 2002) and substance-specific standards (29 CFR 1910.1000, “Air Contaminants,” Tables 2-1 and 2-2).

b. These include (1) nervous system: dizziness, nausea, and lightheadedness; (2) dermis: rashes, itching, and redness; (3) respiratory system: respiratory effects; and (4) eyes: tearing and irritation.

c. If yes, identify agency and appropriate designation (i.e., ACGIH A1 or A2, NIOSH, OSHA, IARC, or NTP).

ACGIH = American Conference of Governmental Industrial Hygienists
CAS = Chemical Abstract Service
CNS = central nervous system
GI = gastrointestinal
IARC = International Agency for Research on Cancer
NIOSH = National Institute of Occupational Safety and Health
NTP = National Toxicology Program
OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
ppm = parts per million
PRD = program requirements document
TLV = threshold limit value

'able 2-2. Summary of remedial actions sampling and field screening of the TSF-06/26 site activities. associated hazards. and mitigation.

Activity or Task	Associated Hazards or Hazardous Agent	Hazard Mitigation
Mobilization and Site Preparation (Support equipment)	Radiological contamination — subsurface soil Radiation exposure	RCT surveys, RWP (as required), dosimetry, direct-reading instruments, and compliance with posted entry and exit requirements
	Chemical and inorganic contaminants	Controlled areas, qualified operators, **JSAs, SWPs,** TPRs. or work packages
	Equipment movement and vehicle traffic — trailers, pinch points; ergonomic concerns; and struck-by or caught-between potential	Trained operators, JSAs, SWPs, TPRs, qualified heavy equipment operator (hoisting and rigging), designated traffic lanes and areas; watch body position, and wear PPE.
	Lifting and back strain	Mechanical equipment movement, proper lifting techniques, and two-person lifts
	Subsidence of soil from heavy equipment	Inspect areas before driving equipment on pit surfaces.
	Heat and cold stress	IH monitoring and work-rest cycles, as required
	Tripping hazards and working-walking surfaces — ice- and snow-covered surfaces and drill rig truck deck and ladders	Salt and sand icy areas; use nonskid or high-friction materials on walking surfaces.
	Stored energy sources-electrical lines and panels, elevated materials, hoisting and rigging, and gas cylinders	Identify and mark all utilities. Ensure that all lines and cords are checked for damage and continuity. Use ground-fault circuit interrupter on outdoor equipment. Comply with minimum clearances for overhead lines, and secure cylinders, caps, and bottles before movement.
Sampling/Drilling	Radiological contamination and radiation exposure	RCT surveys, RWP (as required), dosimetry, direct-reading instruments; comply with posted entry and exit requirements.
	Chemical or inorganic contaminants	Controlled areas, qualified operators, JSAs, SWP, TPRs, or work package.

Table 2-2. (continued).

Activity or Task	Associated Hazards or Hazardous Agent	Hazard Mitigation
	Equipment movement and vehicle traffic—pinch points and struck-by and caught-between potential	Trained operators, JSAs, SWPs, TPRs, qualified heavy equipment operator (hoisting and rigging), designated traffic lanes and areas; watch body position, and wear PPE.
	Lifting and back strain—staging materials Ergonomic concerns	Proper lifting techniques, two-person lifts (as required)
	Heat and cold stress	IH or FTL monitoring and work-rest cycles (as required)
	Tripping hazards and working-walking surfaces—existing probes in the ground as well as ice- and snow-covered surfaces	Salt and sand icy areas; use nonskid or high-friction footwear on walking surfaces.
Excavation, Backfill, Packaging, Temporary Road Construction, and Shipment	Radiological contaminants and radiation exposure	RCT surveys, dosimetry
	Chemical and inorganic contaminants	Material safety data sheets for onsite chemicals, IH monitoring, and PPE
	Heavy equipment movement and vehicle traffic—truck, loader, grader, compactor, water truck, logging truck, forklift, pinch points, ergonomic concerns, and struck-by or caught-between potential	Controlled work areas, qualified operators, JSAs, SWPs, TPRs or work package, proper body position, and PPE
	Lifting and back strain	Proper lifting techniques, two- or three-person lifts (probe casing)
	Hazardous noise levels	Noise surveys and hearing protection (as required)
	Heat and cold stress	IH monitoring, work-rest cycles (as required)
	Tripping hazards and working-walking surfaces—existing probes in ground and ice- and snow-covered surfaces	Salt and sand icy areas; use nonskid or high-friction footwear on walking surfaces

'able 2-2. (continued).

Activity or Task	Associated Hazards or Hazardous Agent	Hazard Mitigation
	Working at elevated levels.	Qualified operators, fall protection plan (as required).

IH = industrial hygienist
JSA = job safety analysis
PPW = personal protective equipment
RCT = radiological control technician
RWP = radiological work permit
SWP = safe work permit
TPR = technical procedure

2.2.1 Material Handling and Back Strain

Material handling and maneuvering of various pieces of equipment could result in employee injury. All lifting and material-handling tasks will be performed in accordance with MCP-2692, “Ergonomics Program.” Personnel will not physically lift objects weighing more than 22 kg (50 lb) or 33% of their body weight (whichever is less) alone. In addition, back strain and ergonomic considerations must be given to material handling and equipment usage. Mechanical and hydraulic lifting devices should be used to move materials whenever possible. The industrial hygienist (IH) will conduct ergonomic evaluations of various project tasks to determine the potential ergonomic hazards and provide recommendations to mitigate these hazards. Applicable requirements from MCP-2739, “Material Handling, Storage, and Disposal,” also will be followed.

2.2.2 Repetitive Motion and Musculoskeletal Disorders

Tasks to be conducted could expose personnel to repetitive-motion hazards, undue physical stress, overexertion, awkward postures, or other ergonomic risk factors that could lead to musculoskeletal disorders. Musculoskeletal disorders can cause a number of conditions, including pain, numbness, tingling, stiff joints, difficulty moving, muscle loss, and sometimes paralysis. The assigned project IH will evaluate project tasks and provide recommendations to reduce the potential for musculoskeletal disorders in accordance with MCP-2692, “Ergonomics Program.”

2.2.3 Working and Walking Surfaces

Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls. The TSF-06/26 sites at WAG 1, OU 1-10 present inherent tripping hazards. In addition, the potential for slip, trip, and fall hazards will increase during winter months because of ice- and snow-covered surfaces combined with objects beneath the snow. During the prejob briefing, all personnel will be made aware of tripping hazards that cannot be eliminated. Tripping and slip hazards will be evaluated during the course of the project in accordance with PRD-2005 or PRD-5103, “Walking and Working Surfaces.”

2.2.4 Elevated Work Areas

Personnel might be required to occasionally work on elevated equipment or at heights above 1.8 m (6 ft). During such work, employees will comply with requirements from PRD-2002 or PRD-5096, “Fall Protection,” and applicable requirements from PRD-2006 or MCP-2709, “Aerial Lifts and Elevating Work Platforms”; PRD-2003, “Ladders”; PRD-2004 or PRD-5098, “Scaffolding”; and PRD-2005 or PRD-5103, “Walking and Working Surfaces.” Where required, a fall protection plan will be written.

2.2.5 Powered Equipment and Tools

Powered equipment and tools present potential physical hazards (e.g., pinch points, electrical hazards, flying debris, struck-by hazards, and caught-between hazards) to personnel operating them. All portable equipment and tools will be properly maintained and used by qualified individuals in accordance with the manufacturer’s specifications. At no time will safety guards be removed. Requirements from PRD-2015, “Hand and Portable Power Tools,” or PRD-5101, “Portable Equipment and Handheld Power Tools,” will be followed for all work performed with powered equipment, including hand tools. The user will inspect all tools before use.

2.2.6 Electrical Hazards and Energized Systems

Electrical equipment and tools—as well as overhead and underground lines associated with Field Sampling for the Remedial Action Sampling, Field Screening, Soil Excavation, Backfill, Packaging, and Shipment of TSF-06/26 Sites at WAG 1, OU 1-10—could pose shock or electrocution hazards to personnel. Safety-related work practices will be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. If work on energized systems is necessary, these practices will conform to the requirements in PRD-2011 or PRD-5099, "Electrical Safety"; MCP-3650, "Chapter IX–Level I Lockout and Tagouts"; MCP-3651, "Chapter IX–Level II Lockouts and Tagouts"; and Parts I through III of National Fire Protection Association (NFPA) 70E, "Standard for Electrical Safety Requirements for Employee Workplaces." In addition, all electrical work will be reviewed and completed under the appropriate work controls (e.g., TPRs and work orders). When working around overhead lines, clearances will be maintained at all times. In addition, all underground utilities and installations will be identified before conducting excavation activities in accordance with PRD-2014, "Excavation and Surface Penetrations."

2.2.7 Fire and Flammable Materials Hazards

Fuel will be required for equipment used during remedial action sampling, field screening, soil excavation, backfill, packaging, and shipment operations. Flammable hazards include transfer and storage of flammable or combustible liquids. Portable fire extinguishers with a minimum rating of 10A/60BC will be strategically located at the project site to combat Class ABC fires. They will be located in all active areas, on or near all facility equipment that has exhaust heat sources, and on or near all equipment capable of generating ignition or having the potential to spark. Guidance from MCP-2707, "Compatible Chemical Storage," will be consulted when storing chemicals.

2.2.7.7 ***Combustible Materials.*** Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. A fire protection engineer should be contacted if questions arise about potential ignition sources. The accumulation of combustible materials will be strictly controlled. Disposal of combustible materials will be assessed at the end of each shift. Class A combustibles (such as trash, cardboard, rags, wood, and plastic) will be disposed of properly in appropriate waste containers. The fire protection engineer also may conduct periodic site inspections to ensure that all fire protection requirements are being met.

2.2.7.2 ***Flammable and Combustible Liquids.*** Fuel used at the site for fueling must be safely stored, handled, and used. Only flammable liquid containers approved by the Factory Mutual and Underwriters Laboratories and labeled with the contents will be used to store fuel. All fuel containers will be stored at least 15 m (50 ft) from any facilities and ignition sources or they will be stored inside an approved flammable storage cabinet. Additional requirements are provided in PRD-308, "Handling and Use of Flammable and Combustible Liquids." Portable motorized equipment (e.g., generators and light plants) will be shut off and allowed to cool down in accordance with the manufacturer's operating instructions before being refueled to minimize the potential for a fuel fire.

2.2.7.3 ***Welding, Cuffing, or Grinding.*** Personnel conducting welding, cutting, or grinding tasks could be exposed to molten metal, slag, and flying debris. In addition, a fire potential exists if combustible materials are not cleared from the work area. Requirements from PRD-2010 or PRD-5110, "Welding, Cutting, and Other Hot Work," will be followed whenever these types of activities are conducted.

2.2.8 Pressurized Systems

A variety of heavy equipment will be operated at the project site. The hazards presented to personnel, equipment, facilities, or the environment due to inadequately designed or improperly operated pressure (or vacuum) systems include blast effects, shrapnel, fluid jets, release of toxic or asphyxiated materials, contamination, equipment damage, personnel injury, and death. These systems can include pneumatic, hydraulic, vacuum, or compressed gas systems. The requirements of PRD-2009, "Compressed Gases"; PRD-5, "Boilers and Unfired Pressure Vessels"; and the manufacturer's operating and maintenance instructions must be followed. This includes inspection, maintenance, and testing of systems and components in conformance with American National Standards Institute (ANSI) requirements.

All pressure systems will be operated in the designed operating pressure range, which is typically 10 to 20% less than the maximum allowable working pressure. All hoses, fittings, lines, gauges, and system components will be rated for the system for at least the maximum allowable working pressure (generally the relief set point). The project safety professional should be consulted about any questions of pressure systems in use at the project site.

2.2.9 Compressed Gases

All cylinders will be used, stored, handled, and labeled in accordance with PRD-2009. In addition, the safety professional should be consulted about any compressed gas cylinder storage, transport, and usage issues.

2.2.10 Heavy Equipment and Moving Machinery

Hazards associated with the operation of heavy equipment include injury to personnel (e.g., struck-by and caught-between hazards) and equipment and property damage. All heavy equipment will be operated in the manner in which it was intended and in accordance with manufacturer's instructions. Only authorized, qualified personnel will be allowed to operate equipment; personnel near operating heavy equipment must maintain visual communication with the operator. Personnel will comply with MCP-2745, "Heavy Industrial Vehicles," and PRD-5 123, "Motor Vehicle Safety."

Personnel working around or near cranes or boom trucks also will comply with PRD-600, "Maintenance Management Requirements." Additional safe practices will include the following:

- All heavy equipment will have backup alarms.
- Walking directly behind or to the side of heavy equipment without the operator's knowledge is prohibited. All precautions will be taken before moving heavy equipment.
- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person who will be responsible for providing direct voice contact or approved standard hand signals. In addition, all facility personnel in the immediate work area will be made aware of the equipment operations.
- All equipment will be kept out of traffic lanes and access ways and will be stored so as not to endanger personnel at any time.
- All unattended equipment will have appropriate reflectors or be bamcaded if left on roadways.

- All parked equipment will have the parking brake set and chocks will be used when equipment is parked on inclines.

- The swing radius of heavy equipment will be adequately barricaded or marked to prevent personnel from entering into the swing radius.

2.2.11 Excavation, Surface Penetrations, and Outages

With the exception of certain soil sampling, all surface penetrations and related outages will be coordinated through the TAN utilities and will require submittal of an outage request (i.e., Form 433.1, "Outage Request") for outages (e.g., road, electrical, and water). The submission of an outage request will not be considered an approval to start the work. Other specific outage requirements are addressed in the special conditions section of the management and operating contract. No surface penetrations will be allowed or conducted until the area has been evaluated and an approved subsurface evaluation documented.

All excavation activities will be conducted and monitored in accordance with PRD-2014 or PRD-22, "Excavation and Surface Penetrations," and 29 CFR 1926, Subpart P, "Excavations." The following are some key elements from these requirements:

- Structural ramps that are used solely by employees as a means of access or egress from excavations will be designed by a competent person. Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design and will be constructed in accordance with the design. Structural ramps will be inspected in accordance with Form 432.57, "Excavation Checklist."

- Employees exposed to public vehicular traffic will be provided with and will wear warning vests or other suitable garments marked with or made of reflecting or high-visibility material.

- Daily inspections of excavations, areas adjacent to the excavations, and protective systems will be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. ***An*** inspection will be conducted by the competent person before the start of work and as needed throughout the shift. Inspections also will be made after every rainstorm or other hazard-increasing occurrence.

- Sloping or benching will be constructed and maintained in accordance with the requirements set forth in 29 CFR 1926, Subpart B, Appendix B, for the soil type as classified by the competent person. This classification of the soil deposits will be made based on the results of at least one visual inspection and at least one manual analysis.

2.2.12 Hoisting and Rigging of Equipment

All hoisting and rigging will be performed in accordance with PRD-2007 or PRD-600, "Maintenance Management Requirements," and DOE-STD-1090-01, "Hoisting and Rigging," Hoisting and rigging equipment will show evidence of a current inspection (e.g., tag) and be inspected before use by qualified personnel. Additionally, the operator or designated person for mobile cranes or boom trucks will perform a visual inspection each day or before use (if the crane has not been in regular service) of items such as, but not limited to, the following:

- **All** control mechanisms for maladjustment that would interfere with proper operation

- Crane hooks and latches for deformation, cracks, and wear
- Hydraulic systems for proper oil level
- Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage
- Hoist ropes for kinking, crushing, birdcaging, and corrosion
- All anti-two-block, two-block warning, and two-block damage prevention systems for proper operation.

2.2.12.1 Drilling Operations. Drilling personnel will be aware of potential drilling equipment hazards and body positioning during all material handling tasks. Specific hazards associated with dnll rigs are described below.

2.2.12.7.7 Slips (Toothed Wedges— Slips are toothed wedges positioned between the drill pipe and the master bushing or rotary cable to suspend the drill string in the well bore when it is not supported by the hoist. Most accidents associated with slip operations are related to manual materials handling. Strained backs and shoulders are common.

2.2.12.1.2 Tongs — Tongs are large, counter-weighted wrenches used to break apart torqued couplings on the dnll pipe. Both sets of tongs have safety lines; when breakout force is applied to the tongs, the tongs or the safety lines could break and injure a worker standing near them. Accidents can occur when the driller activates the wrong tong lever and an unsecured tong swings across the rig floor at an uncontrolled velocity. A common accident attributable to tongs can occur when a worker has a hand or finger in the wrong place in attempting to swing and latch the tong onto the drill pipe, resulting in crushing injuries to, or amputation of, the fingers.

2.2.12.1.3 ***Elevators—***Elevators are a set of clamps affixed to the bails on the swivel below the traveling block. They are clamped to each side of a drill pipe and hold the pipe as it is pulled from the well bore. Accidents and injuries can occur during the latching and unlatching tasks; fingers and hands can be caught and crushed in the elevator latch mechanism. If the pipe is overhead when the latching mechanism fails, the pipe may fall on workers working on the drill floor.

2.2.12.1.4 Catlines—Catlines are used on drilling rigs to hoist material. Accidents that occur during catline operations may injure the worker doing the rigging as well as the operator.

Note: The operator or other designated person will examine deficiencies and determine whether they constitute a safety hazard. If deficiencies are found, they will be reported to the safety professional.

2.2.12.2 Material Handling. The most common type of accident that occurs during material handling is when a load is being handled and a finger or toe is caught between two objects. Rolling stock can shift or fall from a pipe rack or truck bed. Fingers and hands can be caught between sampling barrels, breakout vices, and tools.

2.2.12.3 High-pressure Lines. A high-pressure diversion system will be used to carry cuttings away from the borehole. All high-pressure lines will be equipped with positive locking connectors (e.g., cams) and be secured with properly rated whip checks in case of a connection failure. The project safety professional will be consulted about the rating and proper placements of whip checks or equivalent restraining devices.

2.2.13 Overhead Objects

Personnel may be exposed to falling overhead objects, debris, or equipment or impact hazards during the course of the project. Sources for these hazards will be identified and mitigated in accordance with PRD-2005 or PRD-5103. In the case of overhead impact hazards, they will be marked by using engineering-controls protective systems where there is a potential for falling debris, in combination with head protection PPE.

2.2.14 Personal Protective Equipment

Wearing PPE will reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. In addition, PPE can increase the risk of heat stress. Work activities at the task site will be modified as necessary to ensure that personnel are able to work safely in the required PPE. Work-site personnel will comply with PRD-5121, "Personal Protective Equipment," and MCP-432, "Radiological Personal Protective Equipment." All personnel who wear PPE will be trained in its use and limitations in accordance with PRD-5121.

2.2.15 Decontamination

Decontamination procedures for personnel and equipment are detailed in Section 11. Potential hazards to personnel conducting decontamination tasks include back strain; slip, trip, and fall hazards; and cross-contamination from contaminated surfaces. Additionally, electrical hazards may be present if powered equipment (e.g., a powered pressure washer) is used. Mitigation of these walking-working surfaces and electrical hazards are addressed in other prior subsections. If a power washer or heated power washer is used, units will be operated in accordance with manufacturer's operating instructions, personnel will wear appropriate PPE to prevent high-pressure spray injuries, and ground-fault circuit protection will be used. These tasks will only be conducted in approved areas. Personnel will wear required PPE at all times during decontamination tasks as listed in Section 5.

2.3 Environmental Hazards and Mitigation

Potential environmental hazards will present potential hazards to personnel during project tasks. These hazards will be identified and mitigated to the extent possible. This section describes these environmental hazards and states what procedures and work practices will be followed to mitigate them.

2.3.1 Noise

Personnel involved in project activities may be exposed to noise levels that exceed 85 decibel A-weighted (dBA) for an 8-hour time-weighted average (TWA) or 83 dBA for a 10-hour TWA. The effects of high sound levels (noise) may include the following:

- Personnel being startled, distracted, or fatigued
- Physical damage to the ear and pain and temporary or permanent hearing loss
- Interference with communication that would warn of danger

Where noise levels are suspected of exceeding 80 dBA, noise measurements will be performed in accordance with MCP-2720, "Controlling and Monitoring Exposures to Noise," to determine if personnel are routinely exposed to noise levels in excess of the applicable TWA (85 dBA for **8** hours of exposure or 83 dBA for 10-hour exposures).

Personnel whose noise exposure routinely meets or exceeds the allowable TWA will be enrolled in the INEEL Occupational Medical Program (OMP) (or subcontractor hearing conservation program as applicable). Personnel working on jobs that have noise exposures greater than 85 dBA (83 dBA for a 10-hour TWA) will be required to wear hearing protection until noise levels have been evaluated and will continue to wear the hearing protection specified by the industrial hygienist until directed otherwise. Hearing protection devices will be selected and worn in accordance with MCP-2720.

2.3.2 *Temperature and Ultraviolet* **Light** *Hazards*

Sampling tasks will be conducted during times when there is a potential for heat or cold stress that could present a potential hazard to personnel. The industrial hygienist and HSO will be responsible for obtaining meteorological information to determine if additional heat or cold stress administrative controls are required. All project personnel must understand the hazards associated with heat and cold stress and take preventive measures to minimize the effects. "Heat and Cold Stress" (MCP-2704) guidelines will be followed when determining work-rest schedules or when to halt work activities because of temperature extremes.

2.3.2.1 Heat Stress. High ambient air temperatures can result in increased body temperature, heat fatigue, heat exhaustion, or heat stroke that can lead to symptoms ranging from physical discomfort, unconsciousness, to death. In addition, tasks requiring the use of protective equipment or respiratory protection prevent the body from cooling. Personnel must inform the field team leader (FTL) or HSO when experiencing any signs or symptoms of heat stress or when observing a fellow employee (i.e., buddy) experiencing them. Heat stress stay times will be documented on the appropriate work control document(s); i.e., an SWP, Pre-Job Briefing Form, or other by the HSO in conjunction with the IH (as required) when personnel wear PPE that may increase heat body burden. These stay times will take into account the amount of time spent on a task, the nature of the work (i.e., light, moderate, or heavy), type of PPE worn, and ambient work temperatures. Table 2-3 lists heat stress signs and symptoms of exposure.

2.3.2.2 *Low Temperatures and Cold Stress.* Personnel will be exposed to low temperatures during fall and winter months or at other times of the year if relatively cool ambient temperatures combined with wet or windy conditions exist.

Additional cold weather hazards may exist from working on snow- or ice-covered surfaces. Slip, fall, and material-handling hazards are increased under these conditions. Every effort must be made to ensure walking surfaces are kept clear of ice. The FTL or HSO should be notified immediately if slip or fall hazards are identified at the project locations.

2.3.2.3 *Ultraviolet Light Exposure.* Personnel may be exposed to ultraviolet light (UV) (i.e., sunlight) when conducting project tasks. Sunlight is the main source of UV known to damage the skin and to cause slun cancer. The amount of UV exposure depends on the strength of the light, the length of exposure, and whether the skin is protected. No UV rays or suntans are safe. The following are mitigative actions that may be taken to minimize UV exposure:

- Wear clothing to cover the skin (long pants [no shorts] and long sleeve or short sleeve shirt [no tank tops])
- Use a sunscreen with a sun protection factor of at least 15
- Wear a hat (hard hat where required)

Table 2-3. Heat stress signs and symptoms of exposure.

Heat-Related Illness	Signs and Symptoms	Emergency Care
Heat rash	Red skin rash and reduced sweating.	Keep the skin clean. Change all clothing daily. Cover affected areas with powder containing cornstarch or with plain cornstarch.
Heat cramps	Severe muscle cramps and exhaustion, sometimes with dizziness or periods of faintness.	Move the patient to a nearby cool place. Give the patient half-strength electrolytic fluids. If cramps persist, or if signs that are more serious develop, seek medical attention.
Heat exhaustion	Rapid, shallow breathing; weak pulse; **cold, clammy skin; heavy perspiration;** total body weakness; dizziness that sometimes leads to unconsciousness.	Move the patient to a nearby cool place. Keep the patient at rest. Give the patient half-strength electrolytic fluids. Treat for shock. Seek medical attention. DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT.
Heat stroke	Deep, then shallow, breathing; rapid, strong pulse, then rapid, weak pulse; **dry, hot skin;** dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching.	Cool the patient rapidly. Treat for shock. If cold packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly. DO NOT ADMINISTER FLUIDS OF ANY KIND.

Note: Heat exhaustion and heat stroke are extremely serious conditions that can result in death and should be treated as such. The FTL or designee should immediately request an ambulance to be dispatched from the Test Area North (TAN) (777 or 526-6263), or Central Facilities Area (CFA) -1612 medical facility (777 or 526-1515), and the individual cooled as described above in Table 2-3 based on the nature of the heat stress illness.

- Wear UV-absorbing safety glasses
- Limit exposure during peak intensity hours of 10 a.m. to 4 p.m. whenever possible.

2.3.3 Inclement Weather Conditions

When inclement or adverse weather conditions develop that may pose a threat to persons or property at the project site (e.g., sustained strong winds 25 mph or greater, electrical storms, heavy precipitation, or extreme heat or cold), conditions will be evaluated and a decision made by the HSO with input from other personnel to halt work, employ compensatory measures, or proceed. The FTL and HSO will comply with INEEL MCPs and facility work control documents that specify limits for inclement weather.

2.3.4 Subsidence

Personnel may be exposed to subsidence hazards during project activities. This is primarily an equipment hazard when driving or operating equipment in subsidence areas; however, personnel also may be at risk from walking in these areas. Where required, personnel will not enter potential subsidence areas until they obtain clearance fi-om the area supervisor or facility shift supervisor. Barriers and postings for potential subsidence areas will be observed at all times.

2.3.5 Biological Hazards

The INEEL is located in an area that provides habitat for various rodents, insects, and vectors (i.e., organisms that carry disease-causing microorganisms fi-om one host to another). The potential exists for encountering nesting materials or other biological hazards and vectors. The hantavirus may be present in the nesting and fecal matter of deer mice. If such materials are disturbed, they can become airborne and create a potential inhalation pathway for the virus. Contact and improper removal of these materials may provide additional inhalation exposure risks.

If suspected rodent nesting or excrement material is encountered, the industrial hygienist will be notified immediately and **no attempt will be made to remove or clean the area.** Following an evaluation of the area, disinfection and removal of such material will be conducted in accordance with MCP-2750, "Preventing Hantavirus Infection."

Snakes, insects, and arachnids (e.g., spiders, ticks, and mosquitoes) also may be encountered. Common areas to avoid include material stacking and staging areas, under existing structures (e.g., trailers and buildings), under boxes, and other areas that provide shelter. Protective clothing will generally prevent insects fi-om direct contact with the skin. If potentially dangerous snakes or spiders are found or are suspected of being present, warn others, keep clear, and contact the industrial hygienist or HSO for additional guidance as required.

Insect repellant (DEET or equivalent) may be required. Areas where standing water has accumulated (e.g., evaporation ponds) provide breeding grounds for mosquitoes and should be avoided. In cases where a large area of standing water is encountered, it may be necessary to pump the water out of the declivity (areas other than the evaporation ponds).

2.3.6 Confined Spaces

Work in confined spaces may subject personnel to risks involving engulfment, entrapment, oxygen deficiency, and toxic or explosive atmospheres. If entry into a confined space(s) is required, then all requirements of MCP-2749, "Confined Spaces," will be followed.

2.4 Other Task-Site Hazards

Task-site personnel should continually look for potential hazards and immediately inform the FTL or HSO of the hazards so that action can be taken to correct the condition. All personnel have the authority to initiate STOP WORK actions in accordance with MCP-553, "Stop Work Authority," if it is perceived that an imminent safety of health hazard exists, or they can take corrective actions within the scope of the work control authorization documents to correct minor safety of health hazards and then inform the FTL.

Personnel workmg at the task site are responsible to use safe-work practices, report unsafe working conditions or acts, and exercise good housekeeping habits with respect to tools, equipment, and waste throughout the course of the project.

2.5 Site Inspections

Project personnel may participate in site inspections during the work control preparation stage (such as the hazard identification and verification walk-downs), conduct self-assessments or other inspections. Additionally, periodic safety inspections will be performed by the HSO, project manager, or FTL in accordance with MCP-3449, "Safety and Health Inspections."

Targeted or required self-assessments may be performed during investigation and sampling operations in accordance with MCP-8, "Self-Assessment Process for Continuous Improvement." All inspections and assessments will be documented and available for review by the FTL. These inspections will be noted in the FLT logbook. Health and safety professionals present at the task site may, at any time, recommend changes in work habits to the FTL. However, all changes that may affect the work control documents must have concurrence from the appropriate project technical representatives and a data analysis report prepared when required.

3. EXPOSURE MONITORING AND SAMPLING

A potential for exposure to radiological, chemical, or physical hazards exists during project tasks. Refinement of work control zones (see Section **7),** use of engineering and administrative controls, worker training, and wearing PPE provides the mitigation strategy for these hazards. Monitoring and sampling will be used during project tasks to (1) assess the effectiveness of these controls, (2) determine the type of PPE needed for individual tasks, and (3) determine the need for upgrading and downgrading of PPE as described in Section 5. Monitoring will be conducted in and around the active work location(s) on a periodic basis and as determined necessary based on site-specific conditions. Exposure monitoring regimes are outlined in an Industrial Hygiene Exposure Assessment document contained electronically within the INEEL Hazard Assessment and Sampling System.

3.1 Exposure Limits

Exposure limits identified in Table 3-1 serve as the initial action limits for specific project tasks. Project tasks will be continually assessed in accordance with PRD-25, "Activity Level Hazard Identification, Analysis, and Control," and evaluated by Radiological Control [RadCon] and Industrial Hygiene personnel to ensure engineering control effectiveness. Action limits should be adjusted as required based on changing site conditions, exposure mitigation practices, and PPE levels. In any case, all potential exposures will be kept as low as reasonably achievable.

3.2 Environmental and Personnel Monitoring

Industrial Hygiene and RadCon personnel will conduct initial, periodic, continuous monitoring with direct reading instrumentation, collect swipes, and conduct full- and partial-period air sampling, as deemed appropriate in accordance with the applicable MCPs, OSHA substance-specific standards, and as stated on the RWP and Exposure Assessment. Instrumentation listed on Table 3-2 will be selected based on the site-specific conditions and contaminants associated with project tasks. The radiological control technician (RCT) and industrial hygienist **(M)** will be responsible for determining the best monitoring technique for radiological and nonradiological contaminants (respectively). Safety hazards and other physical hazards will be monitored and mitigated as outlined in Section 2.

3.2.1 Industrial Hygiene Area and Personal Monitoring and Instrument Calibration

The project industrial hygienist will conduct full- and partial-period sampling of airborne contaminants and monitoring of physical agents at a frequency deemed appropriate based on direct-reading instrument readings and changing site conditions. All air sampling will be conducted using applicable National Institute of Occupational Safety and Health (NIOSH), OSHA, or other validated method. Both personal and area sampling and monitoring may be performed.

Various direct-reading instruments may be used to determine the presence of nonradiological and other physical agents. The frequency and type of sampling and monitoring will be determined by changing site conditions, direct-reading instrument results, observation, professional judgment, and in accordance with the MCP-153, "Industrial Hygiene Exposure Assessment."

Table 3-1. Action levels and associated responses for identified hazards.

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
Nuisance particulates (not otherwise classified)	> 10 mg/m^3 (inhalable fraction) >3 mg/m^3 (respirable fraction)	Move personnel to upwind position of source and close equipment cab windows and doors. Use wetting or misting methods to minimize dust and particulate matter. **IF** wetting or misting methods prove ineffective, **THEN** don respiratory protection[a] (as directed by industrial hygienist).
1,1,1 trichloroethane	50ppm in breathing zone	Stop work, move upwind of source, don respiratory protection under direction of Industrial Hygienist. Develop restart plan.
Hazardous noise levels	<85 decibel A-weighted (dBA) 8-hr time-weighted average (TWA), <83dBA 10-hr TWA	No action.
	85 to 114 dBA	Hearing protection required to attenuate hazard to below 85 dBA 8-hour TWA or 83 dBA for 10-hour TWA (device noise reduction rating [NRR]).
	(a) >115 dBA (b) >140 dBA	(a) Isolate the source, evaluate ***NRR*** for single device, double protection as needed. (b) Control entry, isolate source, only approved double protection worn.
Radiation field	<5 mrem/h	No action, no posting required.
	5 to 100 mrem/h @ 30 cm (10 CFR 835.603b)	Post as "Radiation Area"—Required items: Radiological Worker I or II training, radiological wc permit P personal dosimetry.
	>100 mrem to 500 Rad @ 100 cm (10 CFR 835.603b)	Post as "High Radiation Area"—Required items: RW II, RWP, alarming personal dosimetry, dose rate meter, and temporary shielding (as required).
Radionuclide contamination	1 to 100 times Radiological Control Manual[b] Table 2-2 values (10 CFR 835.603d)	Post as "Contamination Area"—Required items: RW II training, personal dosimetry, RWP, don personal protective equipment (PPE), bioassay submittal (as required).
	>100 x Radiological Control Manual[b] Table 2-2 values (10 CFR 835.603d)	Post as "High Contamination Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required).

Contaminant/Agent Monitored	Action Level	Response Taken If Action Levels Are Exceeded
Airborne radioactivity	Concentrations (μCi/cc) >30% of one derived air concentration value (10 CFR 835.603d)	Post as "Airborne Radioactivity Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required).

Table 3-2. Hazards to be monitored and monitoring instruments.

Hazard to be Monitored	Monitoring Instrument Description[a,b]
Hazardous noise	ANSI Type S2A sound level meter or ANSI S1.25-1991 dosimeter (A-weighted average dosimetry, C-weighted for impact dominant sound environments).
Heat stress	Heat stress—wet-bulb globe temperature, body weight, fluid intake.
Dust	• Direct-reading instrument (miniram or DustTrak) • Personal sampling pumps with appropriate media for partial- and full-period sampling using NIOSH or OSHA-validated methods.
Ionizing radiation	(ALPHA) count rate—Bicron/NE Electra (DP-5 or AP-5 probe) or equivalent. Stationary—Eberline RM-25 (HP-380AB or HP-380A probe) or equivalent. (Beta-gamma) Count rate—Bicron/NE Electra (DP-6, BP-17 probes) or equivalent. Stationary—Eberline RM-25 (HP-360AB probe) or equivalent.
Radionuclide contamination	CAM—ALPHA 6-A-1 (in-line and radial sample heads, pump, RS-485) or equivalent (as required). CAM (beta)—AMS-4 (in-line and radial head, pump, RS-485) or equivalent (as required). Grab sampler—SAIC H-810 or equivalent.
1,1,1 Trichloroethane	HNu photoionization meter or equivalent
Mercury	Mercury vapor analyzer (Jerome or equivalent)

a. Monitoring and sampling will be conducted as deemed appropriate by project Industrial Hygiene and Radiological Control personnel based on specific tasks and site conditions.

b. Equivalent instrumentation other than those listed may be used.

ANSI=American National Standards Institute

CAM=continuous air monitor

When RWPs are required for project tasks, the Radiological Control and Information Management System (RCIMS) will be used to track external radiation exposures to personnel. Individuals are responsible for ensuring all required personal information is provided to RadCon personnel for entry into RCIMS and logging into RCIMS when electronic dosimeters are used.

3.2.1.1 Internal Monitoring. The purpose of internal dose monitoring is to demonstrate the effectiveness of contamination control practices and to document the nature and extent of any internal uptakes that may occur. Internal dose evaluation programs will be adequate to demonstrate compliance with 10 CFR 835, "Occupational Radiation Protection." The requirement for whole body counts and bioassays will be based on specific project tasks or activities and will be the determination of the radiological engineer. Bioassay requirements will be specified on the RWP. Project personnel will be responsible for submitting required bioassay samples upon request.

4. ACCIDENT AND EXPOSURE PREVENTION

Project activities will present numerous hazards to personnel conducting these tasks. It is critical that all personnel understand and follow the site-specific requirements of this HASP. Engineering controls, hazard isolation, specialized work practices, and the use of PPE will all be implemented to eliminate or mitigate all potential hazards and exposures where feasible. However, all personnel are responsible for the identification and control of hazards in their work area in accordance with Integrated Safety Management System (ISMS) principals and practices. At no time will hazards be left unmitigated without implementing some manner of controls, (e.g., engineering controls, administrative controls, or the use of PPE). Project personnel should use stop work authority in accordance with MCP-553, "Stop Work Authority," where it is perceived that imminent danger to personnel, equipment, or the environment exists.

This HASP is to be used in conjunction with INEEL PRD-25, "Activity Level Hazard Identification, Analysis, and Control," and work authorization and control documents such as STD-101 work orders, JSAs, MCP-3562, "Hazard Identification, Analysis, and Control of Operational Activities," and operational technical procedures. Where appropriate, MCP-3562 and GDE-6212, "Hazard Mitigation Guide for Integrated Work Control Process," mitigation guidance, JSAs, and RWPs will be incorporated into applicable sections of the HASP.

4.1 Voluntary Protection Program and Integrated Safety Management

The INEEL safety processes embrace the Voluntary Protection Program (VPP) and ISMS criteria, principles, and concepts to identify and mitigate hazards, thereby preventing accidents. All management and workers are responsible for implementing safety policies and programs and for maintaining a safe and healthful work environment. Project personnel are expected to take a proactive role in preventing accidents, ensuring safe working conditions for themselves and fellow personnel, and complying with all work control documents, procedures, and permits.

The ISMS is focused on the system side of conducting operations. The Voluntary Protection Program concentrates on the people aspect of conducting work. Both programs define work scope, identify and analyze hazards, and mitigate the hazards. Additional information on these programs is available on the INEEL Intranet. Bechtel BWXT Idaho, LLC (current primary management and operating contractor) and its subcontractors participate in VPP and ISMS for the safety of their employees. This document includes all elements of both systems. The five key elements of VPP and ISMS and their corresponding HASP sections are as follows:

4.2 General Safe-Work Practices

Sections 1 and 2 defined the project scope of work and associated project-specific hazards and mitigation. The following practices are mandatory for all project personnel to further reduce the likelihood of accidents and injuries. All visitors permitted to enter work areas must follow these requirements. Failure to follow these practices may result in permanent removal from the project and other disciplinary actions. The project FTL and HSO will be responsible for ensuring the following safe-work practices are adhered to at the project site:

- Limit work area access to authorized personnel only, in accordance with PRD-1007, "Work Coordination and Hazard Control," and Section 7.

- All personnel have the authority to initiate STOP WORK actions in accordance with MCP-553.

- Personnel will not eat, drink, chew gum or tobacco, smoke, apply sunscreen, or perform any other practice that increases the probability of hand-to-mouth transfer and ingestion of materials in work areas, except within designated areas.

- Be aware of and comply with all safety signs, tags, barriers, and color codes as identified in accordance with PRD-2022, "Safety Signs, Color Codes, and Barriers," or PRD-5117, "Accident Prevention Signs, Tags, Barriers, and Color Codes."

- Be alert for dangerous situations, strong or irritating odors, airborne dusts or vapors, and spills that may be present. Report all potentially dangerous situations to the FTL or HSO.

- Avoid direct contact with hazardous materials and waste. Personnel will not walk through spills or other areas of contamination and will avoid kneeling, leaning, or sitting on equipment or surfaces that may be contaminated.

- Be familiar with the physical characteristics of the project site, including, but not limited to:

  - Prevailing wind direction
  - Location of fellow personnel, equipment, and vehicles
  - Communications at the project site and with nearest facility
  - Area and the type of hazardous materials stored and waste disposed of
  - Major roads and means of access to and from the project site
  - Location of emergency equipment
  - Warning devices and alarms for area or facility
  - Capabilities and location of nearest emergency assistance.

- Report all broken skin or open wounds to the operations manager, FTL, or HSO. An OMP physician must examine all wounds to determine the nature and extent of the injury. If required to enter into a radiological contamination area, a RadCon supervisor will determine whether the wound can be bandaged adequately in accordance with Article 542 of the INEEL Radiological Control Manual (Manual 15A).

- Prevent releases of hazardous materials. If a spill occurs, personnel must try to isolate the source (if possible, and if this does not create a greater exposure potential) and then report it to the FTL, or HSO. The Warning Communications Center (WCC) will be notified and additional actions will be taken, as described in Section 10. Appropriate spill response kits or other containment and absorbent materials will be maintained at the project site.

- Illumination levels during project tasks will be in accordance with 29 CFR 1910.120 (Table H-120.1, "Minimum Illumination Intensities in Foot-Candles").

- Ground-fault protection will be provided whenever electrical equipment is used outdoors.

- Keep all ignition sources at least 15 m (50 ft) from explosive or flammable environments and use nonsparking, explosion-proof equipment, if advised to do so by safety professionals.

- Follow all safety and radiological precautions, limitation of technical procedures, and requirements identified in work packages.

4.3 Radiological and Chemical Exposure Prevention

Exposure to potential chemical, radiological, and physical hazards will be mitigated by using engineering controls, administrative controls, or PPE to prevent exposures where possible or minimize them where engineering controls are not feasible. All project personnel are responsible for understanding the hazard identification and mitigation measures necessary to prevent exposures.

4.3.1 Radiological Exposure Prevention—As Low as Reasonably Achievable Principles

Radiation exposure of project personnel will be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit. **Unplanned and preventable exposures are considered unacceptable.** All project tasks will be evaluated with the goal of eliminating or minimizing exposures. All project personnel have the responsibility for following as-low-as reasonably achievable principles and practices. Personnel working at the site must strive to keep both external and internal radiation doses as low as reasonably achievable.

Radiological work permits will be written, as required, for project tasks that will define hold points, required dosimetry, RCT coverage, radiological controlled areas, and radiological limiting conditions in accordance with MCP-7, "Radiological Work Permit." Radiological Control personnel will participate in the prejob briefing required by MCP-3003, "Performing Pre-Job Briefings and Post-Job Reviews," to ensure that all personnel understand the dose rate limits and limiting conditions on the RWP. All personnel will be required to read and acknowledge the RWP requirements before being allowed to sign the RWP (or scan the RWP bar code) and obtain electronic dosimetry.

Monitoring for radiation and contamination during project tasks will be conducted in accordance with the RWP; PRD-183, *Manual I SA—Radiation Protection—INEEL Radiological Controls; Manual I 5B—Radiation Protection Procedures; Manual I 5C—Radiological Control Procedures;* and as deemed appropriate by RadCon personnel.

4.3.2 Chemical and Physical Hazard Exposure Avoidance

Note: Identification and control of exposures to carcinogens will be conducted in accordance with MCP-2703, "Carcinogens."

Threshold limit values (TLVs) or other occupation exposure limits have been established for numerous chemicals and physical agents (e.g., noise, heat, or cold stress) that may be encountered. These exposure limits provide guidelines in evaluating airborne, skin, and physical agent exposures. The TLVs represent levels and conditions under which it is believed that nearly all workers may be exposed day after day without adverse health effects. The TLV-time-weighted average (TLV-TWA) is a time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects. Action limits (instantaneous concentrations for short time periods) have been established (Section 3) to further reduce the likelihood of exceeding TLVs.

Controls will be employed to eliminate or mitigate chemical and physical hazards wherever feasible. The hierarchy of controls in order are (1) engineering controls, (2) administrative controls, and **(3)** PPE. In addition to these controls, use of technical procedures and work orders, hold points, training, and monitoring of hazards will be used as appropriate to reduce exposure potential. Some methods of exposure avoidance include:

- Wearing all required PPE, inspecting all pieces before donning, and taping all seams
- Changing PPE if it becomes damaged or shows signs of degrading
- Minimizing time in direct contact with hazardous material and waste
- Doff PPE following standard practices (i.e., rolling outer surfaces in and down) and follow doffing sequence
- Wash hands and face before eating, drinking, smoking, or engaging in other activities that may provide a pathway for contaminants.

4.4 Buddy System

The two-person, or "buddy" system, will be used during project tasks. The buddy system is most often used during project activities requiring the use of protective clothing and respiratory protection where heat stress and other hazards may impede a person's ability to self-rescue. The buddy system requires each employee to assess and monitor his or her buddy's mental and physical well-being during the course of the operation. **A** buddy must be able to perform the following activities:

- Provide assistance if required
- Verify the integrity of PPE
- Observe his or her buddy for signs and symptoms of heat stress, cold stress, or contaminant exposure
- Notify other personnel in the area if emergency assistance is needed.

The buddy system will be administered by the FTL in conjunction with the HSO.